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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------------|------------------------|
| 10/784,472 | 02/24/2004 | David Brady | 280/102 | 1758 |
| 30310 7590 08/07/2007 DIGITAL OPTICS CORPORATION C/O LEE & MORSE, P.C. 3141 FAIRVIEW PARK DRIVE, SUITE 500 FALLS CHURCH, VA 22042 | | | EXAMINER KHAN, USMAN A | |
| | | | ART UNIT 2622 | PAPER NUMBER |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|-------------------------------|------------------------------|--|
| Office Action Summary | Application No. 10/784,472 | Applicant(s) BRADY ET AL. | |
| | Examiner Usman Khan | Art Unit 2622 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 5/18/2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>07/26/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of species 1 in the reply filed on 5/18/2007 is acknowledged. The traversal is found persuasive.

The restriction requirement is withdrawn.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 07/26/2006 has been considered by the examiner. The submission is in compliance with the provisions of 37 CFR 1.97.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 – 4, 6, 9 - 13, 15 – 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Tanida et al. (US patent No. 7,009,652).

Regarding **claim 1**, Tanida et al. teaches an imaging system (column 2 lines 46 – 58), comprising: an array of lenses (figure 1 item 1 microlens array with plurality of microlenses 1a; also column 3 lines 52 – column 4 line 9); a plurality of sensor pixels for each lens (figure 1 item 3 photosensitive element array with plurality of photosensitive elements 3a; also column 3 lines 52 – column 4 line 9), the sensor pixels being on an image plane of the imaging system (figure 1); and a corresponding plurality of focal plane coding elements ([figure 8 item 4 polarizing filter array with plurality of polarizing filters 4a; also column 6 lines 25 – 60] and/or [figure 15 item 7 diffraction grating; also column 10 lines 57 *et seq.*] and/or [figure 1, item 2 partition wall layer with partition layers 2a]), a focal plane coding element provided for each sensor pixel having multiple sub-pixel resolution elements (figure 1 and ([figure 8 item 4 polarizing filter array with plurality of polarizing filters 4a; also column 6 lines 25 – 60] and/or [figure 15 item 7 diffraction grating; also column 10 lines 57 *et seq.*] and/or [figure 1, item 2 partition wall layer with partition layers 2a])), the focal plane coding element being between the lens and sensor pixel (figure 1 and ([figure 8 item 4 polarizing filter array with plurality of polarizing filters 4a; also column 6 lines 25 – 60] and/or [figure 15 item 7 diffraction grating; also column 10 lines 57 *et seq.*]), wherein sub-pixel resolution elements over the plurality of focal plane coding elements represent a selected transform matrix (column 6 line 18 – 24; it is inherent that the inverse matrix method will be accomplished using a inverse matrix), the output of the plurality of sensor pixels being an image multiplied by the selected transform matrix (column 6 line 18 – 24; it is inherent that the inverse matrix method will be accomplished using a inverse matrix), the selected

transform matrix having a non-zero determinant (column 6 line 18 – 24; it is inherent that a inverse matrix has a non-zero determinant).

Regarding **claim 2**, as mentioned above in the discussion of claim 1, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches that the focal plane-coding element provides sub-pixel shifted multiple images on each sensor pixel (figure 5 and column 6 lines 5 – 17).

Regarding **claim 3**, as mentioned above in the discussion of claim 1, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches that the focal plane-coding element is an apertured mask (figure 1, item 2 partition wall layer with partition layers 2a).

Regarding **claim 4**, as mentioned above in the discussion of claim 1, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches that the imaging system further comprising color filters (column 11 lines 24 – 38).

Regarding **claim 6**, as mentioned above in the discussion of claim 1, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches a birefringent structure adjacent the focal plane-coding element (figure 2).

Regarding **claim 9**, as mentioned above in the discussion of claim 1, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches at least one sensor pixel receives light from more than one lens of the array of lenses (figure 11, 12A, and 12B).

Regarding **claim 10**, as mentioned above in the discussion of claim 1, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches a processor receiving the outputs of the sensor pixels and multiplying the outputs by an inverse of the selected transform matrix (column 6 line 18 – 24; inverse matrix method and column 3 lines 63 *et seq.* processing unit U).

Regarding **claim 11**, as mentioned above in the discussion of claim 10, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches that the processor reconstructs an image from the outputs, a number of image pixels in the image being greater than the plurality of sensor pixels (column 2 lines 46 – 58).

Regarding **claim 12**, Tanida et al. teaches an imaging system (column 2 lines 46 – 58), comprising: an array of lenses (figure 1 item 1 microlens array with plurality of microlenses 1a; also column 3 lines 52 – column 4 line 9); a plurality of sensor pixels for each lens (figure 1 item 3 photosensitive element array with plurality of photosensitive elements 3a; also column 3 lines 52 – column 4 line 9); a corresponding plurality of filters ([figure 8 item 4 polarizing filter array with plurality of polarizing filters 4a; also

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column 6 lines 25 – 60] and/or [figure 15 item 7 diffraction grating; also column 10 lines 57 *et seq.*] and/or [figure 1, item 2 partition wall layer with partition layers 2a]), a filter provided for each sensor pixel having multiple sub-pixel resolution elements and providing a sub-pixel shifted multiple image on each sensor pixel (figure 1 and ([figure 8 item 4 polarizing filter array with plurality of polarizing filters 4a; also column 6 lines 25 – 60] and/or [figure 15 item 7 diffraction grating; also column 10 lines 57 *et seq.*] and/or [figure 1, item 2 partition wall layer with partition layers 2a]); and a processor receiving outputs from each sensor pixel and reconstructing an image (column 6 line 18 – 24; inverse matrix method and column 3 lines 63 *et seq.* processing unit U), a number of image pixels in the image being greater than the plurality of sensor pixels (column 2 lines 46 – 58).

Regarding **claim 13**, as mentioned above in the discussion of claim 12, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches a birefringent structure plurality of filters ((column 2 lines 46 – 58; also [figure 8 item 4 polarizing filter array with plurality of polarizing filters 4a; also, column 6 lines 25 – 60] and/or [figure 15 item 7 diffraction grating; also column 10 lines 57 *et seq.*]).

Regarding **claim 15**, as mentioned above in the discussion of claim 12, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches at least one sensor pixel receives light from more than one lens of the array of lenses (figure 11, 12A, and 12B).

Regarding **claim 16**, as mentioned above in the discussion of claim 12, Tanida et al. teaches all of the limitations of the parent claim. Additionally, Tanida et al. teaches that the focal plane-coding element is an apertured mask (figure 1, item 2 partition wall layer with partition layers 2a).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanida et al. (US patent No. 7,009,652) in further view of Bills (US patent No. 6,366,319).

Regarding **claim 5**, as mentioned above in the discussion of claim 1 Tanida et al. teaches all of the limitations of the parent claim.

However, Tanida et al. fails to teach that the color filters are integral with the focal plane-coding element. Bills, on the other hand teaches that the color filter is adjoined to another element in the focal plane.

More specifically, Bills teaches that the color filter is adjoined to a focal plane array (FPA) located in the focal plane (Figures 1, 2A, 6, and 7; items 105 and 107; Also, Abstract; Also, column 2 lines 29 - 37).

Therefore, one of ordinary skill in the art at the time the invention was made would have been motivated to incorporate the teachings of Bills with the teachings of Tanida et al. because in column 2 lines 29 – 37 Bills teaches that this mosaics attempt to match the wavelength-dependent sensitivity of the human eye by including a larger percentage of green pixels than red and blue pixels which in turn will produce a more natural image. Also the combination of the color filter is adjoined to a focal plane array will produce a simpler device which will reduce size by not requiring the two components at two different sections of the camera.

Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanida et al. (US patent No. 7,009,652) in further view of Meyers (US patent No. 6,137,535).

Regarding **claim 7**, as mentioned above in the discussion of claim 1 Tanida et al. teaches all of the limitations of the parent claim.

However, Tanida et al. fails to teach a corresponding plurality of focusing lenses, a focusing lens between the focal plane encoding element and a corresponding sensor pixel. Meyers, on the other hand teaches a corresponding plurality of focusing lenses, a focusing lens between the focal plane encoding element and a corresponding sensor pixel.

More specifically, Meyers teaches a corresponding plurality of focusing lenses, a focusing lens between the focal plane encoding element and a corresponding sensor pixel (figure 2; items 72, 10, and 24).

Therefore, one of ordinary skill in the art at the time the invention was made would have been motivated to incorporate the teachings of Meyers with the teachings of Tanida et al. because in column 3 lines 46 - 55 Meyers teaches that by use of the invention an extremely compact digital camera with a lenslet array in close proximity to a photodetector array is formed. Due to the larger sub-image size a reduced number of lenslets are needed to construct the full image. By utilizing the space between sub-groups of photodetectors for signal processing electronics, the digital camera can be formed on a single substrate. In addition, a large high-resolution sensor can be synthesized by the use of sub-groups of photodetectors.

Regarding **claim 14**, as mentioned above in the discussion of claim 12 Tanida et al. teaches all of the limitations of the parent claim.

However, Tanida et al. fails to teach a corresponding plurality of focusing lenses, a focusing lens between the filter and a corresponding sensor pixel. Meyers, on the other hand teaches a corresponding plurality of focusing lenses, a focusing lens between the filter and a corresponding sensor pixel.

More specifically, Meyers teaches a corresponding plurality of focusing lenses, a focusing lens between the focal plane encoding element and a corresponding sensor pixel (figure 2; items 72, 10, and 24).

Therefore, one of ordinary skill in the art at the time the invention was made would have been motivated to incorporate the teachings of Meyers with the teachings of Tanida et al. because in column 3 lines 46 - 55 Meyers teaches that by use of the

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invention an extremely compact digital camera with a lenslet array in close proximity to a photodetector array is formed. Due to the larger sub-image size a reduced number of lenslets are needed to construct the full image. By utilizing the space between sub-groups of photodetectors for signal processing electronics, the digital camera can be formed on a single substrate. In addition, a large high-resolution sensor can be synthesized by the use of sub-groups of photodetectors.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanida et al. (US patent No. 7,009,652) in further view of Examiners' Official Notice.

Regarding 8, as mentioned above in the discussion of claim 1 Tanida et al. teach all of the limitations of the parent claim. Additionally, Tanida et al. teaches that the columns and rows can be varied (column 7 lines 24 – 40)

However, Tanida et al. fails to teach that the selected transform matrix has fewer rows than columns.

The examiner takes Official Notice that it is old and well known in the art to use matrices of different sizes.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a matrix with fewer rows than columns to have a wide angle image.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Feldman et al. (US patent No. 20050073603) teaches a filter/partition between a lens array and image pickup element.

Publication: APPLIED OPTICS, Vol. 40, No. 11, 10 April 2001, "Thin observation module by bound optics (TOMOBO) concept and experimental verification".

Publication: OPTICS EXPRESS, Vol. 11, No. 18, 8 September 2003, "Color imaging with an integrated compound imaging system".

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Usman Khan whose telephone number is (571) 270-1131. The examiner can normally be reached on Mon-Thru 6:45-4:15; Fri 6:45-3:15 or Alt. Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Usman Khan
08/03/2007
Patent Examiner
Art Unit 2622



DAVID OMETZ
SUPERVISORY PATENT EXAMINER